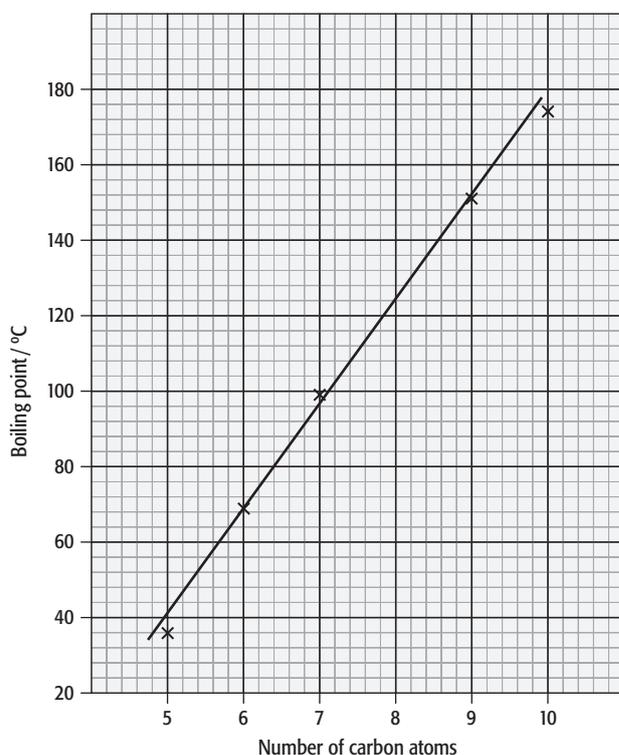


# Answers to worksheet questions

## Chapter 10

### Worksheet 10.1

1 a



b The boiling point increases regularly as the number of carbons in the chain increases. (Although a straight line is drawn here, it is possible to draw a smooth curve through the points on the graph.)

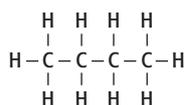
c about 125°C

d A

This fraction has a boiling point range corresponding to molecules of the correct length for the gasoline (petrol) fraction.

2 a An alkane is a saturated hydrocarbon in which all the C–C bonds are single bonds. General formula  $C_nH_{2n+2}$

b  $CH_3CH_2CH_2CH_3$



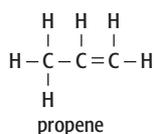
c carbon dioxide and water

d  $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$

## Worksheet 10.2

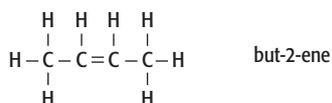
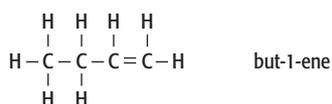
1 a An alkene is an unsaturated hydrocarbon that contains at least one C=C double bond. General formula  $C_nH_{2n}$

b  $CH_3CHCH_2$



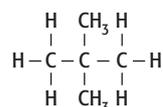
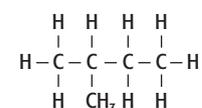
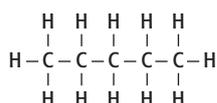
c butene,  $C_4H_8$

d i, ii



iii They are isomers.

2 a pentane,  $C_5H_{12}$

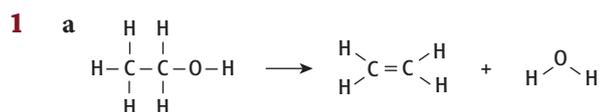


b pentane, 2-methylbutane, 2,2-dimethylpropane

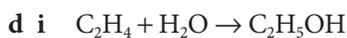
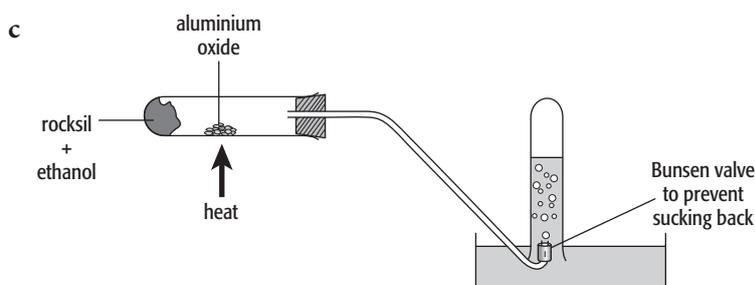
3 a An unsaturated hydrocarbon is more reactive because the C=C double bond can open and other molecules add on to it / they can take part in addition reactions.

b An alkene turns bromine water immediately colourless because the bromine adds across the C=C double bond. An alkane has no double bond.

## Worksheet 10.3



b dehydration reaction: a reaction in which water is removed



ii hydration

iii Phosphoric acid is a catalyst.

e i fermentation

ii advantage: the starting material is renewable

disadvantage: the product is not pure and needs further processing

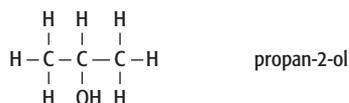
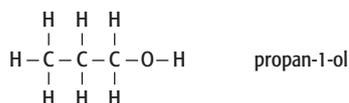
2 a i the alcohols

ii  $C_nH_{2n+1}OH$

iii the  $-OH$  group

b i  $C_3H_7OH$

ii



## Worksheet 10.4

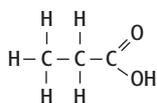
1 a the carboxylic acids

b the  $-COOH$  group

c Ethanoic acid is a weak acid as it is only partially ionised in solution in water / not all the ethanoic acid molecules split up into ions.

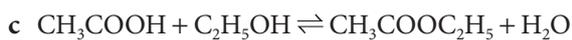


d



2 a ethyl ethanoate

b an ester



d Sulfuric acid is a catalyst.

e propanoic acid and methanol

## Worksheet 10.5

- 1** a open  
b There is a better supply of air to help with the burning / more efficient burning gives a higher temperature.
- 2** a carbon and hydrogen  
b carbon dioxide and water
- 3** a The activation energy is the amount of energy required to start a reaction / this is because some bonds must first be broken before any new bonds can form / bond breaking requires energy.  
b A catalyst speeds up a reaction by lowering the activation energy of a reaction.
- 4** a Butane is easier to light.  
Charcoal is less expensive and easier to store.  
b i liquid: particles close together but moving about  
ii gas: particles far apart and moving randomly  
c evaporation  
d 
$$\begin{array}{cccc} & \text{H} & \text{H} & \text{H} & \text{H} \\ & | & | & | & | \\ \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{H} \\ & | & | & | & | \\ & \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$
  
e Butane consists of separate molecules with only weak forces between the molecules.  
f The spark provides the activation energy to break the first bonds and allow the reaction to happen.

## Worksheet 10.6

- 1** carbon atoms show versatility by:
- ◆ forming chains of carbon atoms – which can be straight or branched
  - ◆ forming multiple bonds between carbon atoms
  - ◆ forming ring structures.
- 2** covalent bonding; outer electrons shared between atoms
- 3** A is graphite.  
B is diamond.
- 4** a Diamond is hard because all the atoms in the structure are joined by strong covalent bonds.  
b In graphite, there are only weak forces between the layers, so the layers can slide over each other.
- 5** There are free (mobile/delocalised) electrons in graphite that are not used in bonding and they can move between the layers and carry an electric current.